Evaluation of European Deposit Insurance Scheme Funding Based on Risk Analysis [1]

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Context of our work:

- 2008-2009. Financial crisis
- 2014. Directive on Deposit Guarantee schemes (DGSD)
- 2015. EBA proposal for the establishment of European Deposit Insurance Scheme (EDIS)
  - <2020: Reinsurance stage. Contribution based on national banking system
  - 2020-2024: Coinsurance stage. Contribution based on Banking Union (BU)
  - >2024: Mutualized stage. Contribution based on BU
- 2020. COVID-19. EBA impact study:
  - + banking risk, + volatility in financial markets - asset quality

Mutualized stage:

- EDIS:
  - Only deposit insurance in Eurozone. Replace national schemes
  - Absorb all liquidity needs and losses
- Problems:
  - Cross-border subsidies
  - Moral hazard
  - Risk-taking behavior
- Solution:
  - Risk-sharing methodology for contributions

- Data sources:
  - Orbis Bank Focus database
  - European deposit guarantee systems data
- Sample:
  - Year: 2018
  - Eurozone banks: 806
  - Covered deposits: €4.9 trillions, 81% in the Eurozone

Table 1. Representativeness of sample

Country	Total Covered deposit population (bn €)	Covered deposit population (%)	Total Covered deposit sample (bn €)	Representativenss of de sample (%)	Number of Banks in the sample
Austria (AT)	219	3.6	179	82	45
Belgium (BE)	293	4.8	275	94	13
Cyprus (CY)	26	0.4	26	99	18
Germany (DE)	1815	30.0	1053	58	138
Estonia (EE)	9	0.1	8	87	7
Spain (ES)	726	12.0	719	99	27
Finland (FI)	129	2.1	125	97	138
France (FR)	1168	19.3	1028	88	82
Greece (GR)	104	1.7	96	92	5
Ireland (IE)	106	1.8	105	99	7
Italy (IT)	699	11.5	601	86	186
Lithuania (LT)	14	0.2	13	91	5
Luxembourg (LU)	32	0.5	17	54	17
Latvia (LV)	8	0.1	8	95	10
Malta (MT)	12	0.2	10	86	6
Netherland (NL)	499	8.2	494	99	15
Portugal (PT)	144	2.4	108	75	70
Slovenia (SI)	19	0.3	16	85	9
Slovakia (SK)	32	0.5	30	93	8
Total	6,056	100.0	4,913	81	806

Source: *Own work*

- We used SYMBOL microsimulation model (**De˙Lisa˙2011**)
- SYMBOL's methodological phases:
  - Step 1. Estimation of the implied obligor probability of default ($IOPD_i$)
  - Step 2. Simulation of correlated losses
  - Step 3. Determination of bank failure
  - Step 4. EDIS loss distribution

- We analyse contagion risk using three correlations structures:
  - Σ_1: 1; 0.5; 0
  - Σ_2: 1; 0.5; 0,5
  - Σ_3: 1; 0.6; 0.3
- We evaluated model risk using different decomposition methods and calculations procedures
- We run several numbers of simulations:
  - 100,000
  - 500,000
  - 1,000,000

- We use two risk measures:
  - VaR
  - ES
- and several confidence levels:
  - 99%
  - 99.5%
  - 99.9%
  - 99.95%
  - 100%
- We conduct a sensitivity analysis of risk portfolio:
  - x2
  - x5

Table 2. EDIS loss distribution

	Σ_1			Σ_2			Σ_3		
Defaults	11,124			10,806			11,214		
Mean (bn €)	0.78			0.79			0.73		
St. Dev. (bn €)	3.89			3.78			3.41		
Skewness	0.16			0.15			0.15		
Kurtosis	28.22			28.20			26.24		
TFCL (%)	99.97			99.97			99.97		
Percentile (%)	VaR (bn €)	ES (bn €)	FN (%)	VaR (bn €)	ES (bn €)	FN (%)	VaR (bn €)	ES (bn €)	FN (%)
99.00	0.00	7.81	0.00	0.00	8.12	0.00	0.00	8.43	0.00
99.50	0.00	15.63	0.00	0.00	16.24	0.00	0.00	16.87	0.00
99.90	0.97	77.57	0.02	0.97	80.69	0.02	0.83	83.95	0.02
99.95	6.74	152.37	0.14	6.34	158.92	0.13	4.92	165.99	0.10
99.96	12.60	188.34	0.26	12.32	196.42	0.25	11.13	205.71	0.23
99.97	23.49	244.93	0.48	22.50	255.94	0.46	22.48	268.76	0.46
99.98	56.21	347.63	1.14	59.00	365.33	1.20	58.98	385.22	1.20
99.99	156.78	599.75	3.19	167.21	633.17	3.40	222.29	667.83	4.52
100.00	1,954.96	1,954.96	39.79	2,112.34	2,112.34	43.00	2,205.49	2,205.49	44.89

Source: *Own work*

Table 3. IOPDx2 sensitivity analysis

	Σ_1			Σ_2			Σ_3		
Defaults	48,939			48,257			49,029		
Mean (bn €)	0.88			0.92			1.06		
St. Dev. (bn €)	3.98			4.14			4.86		
Skewness	0.07			0.07			0.08		
Kurtosis	5.74			6.39			7.05		
TFCL (%)	99.88			99.89			99.89		
Percentile (%)	VaR (bn €)	ES (bn €)	FN (%)	VaR (bn €)	ES (bn €)	FN (%)	VaR (bn €)	ES (bn €)	FN (%)
99.00	0.00	39.16	0.00	0.00	37.89	0.00	0.00	39.63	0.00
99.50	0.70	78.04	0.01	0.67	75.52	0.01	0.44	79.15	0.01
99.90	53.58	360.41	1.09	52.10	349.00	1.06	49.27	373.27	1.00
99.95	173.61	629.87	3.53	162.19	608.97	3.30	163.01	660.47	3.32
99.96	234.29	708.18	4.77	235.69	733.63	4.80	244.57	772.58	4.98
99.97	336.07	843.80	6.84	385.34	874.76	7.84	394.91	924.22	8.04
99.98	483.76	1,054.38	9.85	586.96	1,077.14	11.95	597.85	1,150.90	12.17
99.99	899.41	1,385.44	18.31	985.37	1,410.40	20.06	1,040.64	1,513.96	21.18
100.00	2,499.98	2,499.98	50.89	2,751.52	2,751.52	56.01	3,316.35	3,316.35	67.50

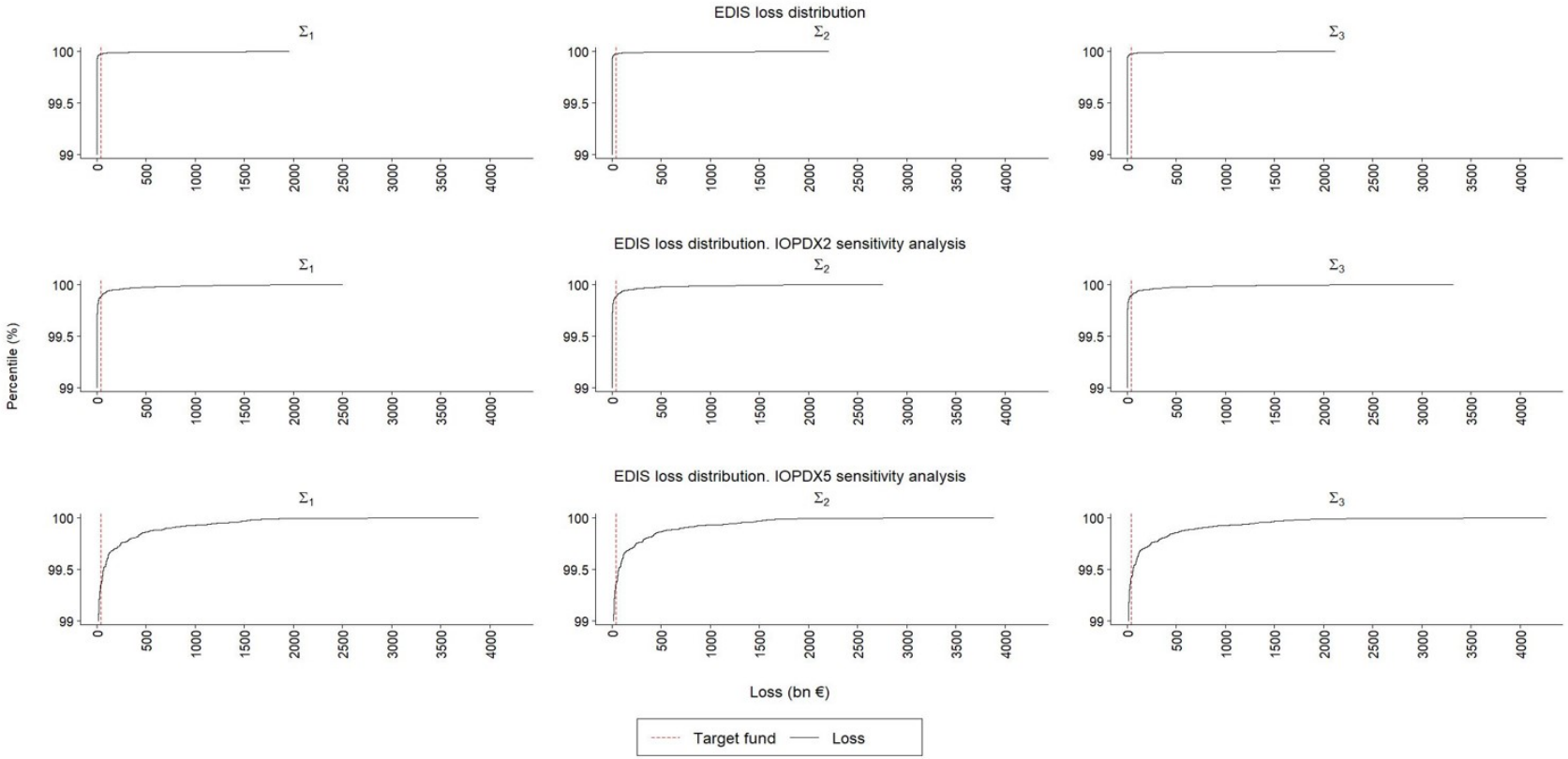
Source: *Own work*

Table 4. IOPDx5 sensitivity analysis

	Σ_1			Σ_2			Σ_3		
Defaults	275,851			274,632			276,524		
Mean (bn €)	1.25			1.26			1.60		
St. Dev. (bn €)	4.94			5.11			6.48		
Skewness	0.03			0.03			0.03		
Kurtosis	1.11			1.13			1.37		
TFCL (%)	99.34			99.35			99.42		
Percentile (%)	VaR (bn €)	ES (bn €)	FN (%)	VaR (bn €)	ES (bn €)	FN (%)	VaR (bn €)	ES (bn €)	FN (%)
99.00	13.90	242.45	0.28	14.22	240.79	0.29	10.79	245.17	0.22
99.50	67.68	451.94	1.38	67.83	448.86	1.38	62.53	464.90	1.27
99.90	708.09	1,290.55	14.41	696.88	1,285.99	14.18	722.47	1,380.01	14.71
99.95	1,245.28	1,622.61	25.35	1,278.30	1,620.30	26.02	1,309.99	1,766.24	26.66
99.96	1,362.78	1,693.22	27.74	1,433.71	1,694.76	29.18	1,456.40	1,869.25	29.64
99.97	1,472.73	1,770.74	29.98	1,476.32	1,774.49	30.05	1,520.59	1,996.72	30.95
99.98	1,562.30	1,897.31	31.80	1,568.73	1,901.94	31.93	1,692.69	2,193.39	34.45
99.99	1,746.47	2,151.85	35.55	1,737.80	2,166.25	35.37	2,008.22	2,563.84	40.88
100.00	3,881.91	3,881.91	79.02	3,883.59	3,883.59	79.05	4,264.09	4,264.09	86.79

Source: *Own work*

Figure 1. EDIS loss distribution.



Source: *Own work*

- EBA developed a guidelines on methods for calculating risk-adjusted contribution for national DIS (EBA, 2015)
- Member states develop their own calculation methods using established guidelines
- EBA conducts periodic reviews.
- In the last it conclude that no changes are necessary
- Methods to calculate contributions:
  - Bucket method
  - Sliding scale methods:
    - Linear
    - Exponential

Risk-adjusted contribution for i-th bank (C_i) is given for following equation:

$$C_i = CR \cdot ARW_i \cdot CD_i \cdot \mu \tag{1}$$

where:

- CR: contribution rate
- ARW_i: aggregate risk weight for i-th bank
- CDi: covered deposits for i-th bank
- μ: adjustment coefficient

ARW is determined in the following steps:

1. Definition of risk indicators (*IR*)
2. Transformation of indicator values into an individual risk score (*IRS*)
3. Calculation of the aggregate risk score (*ARS*)
4. Determination of the aggregate risk weight (*ARW*)

Table 5. Risk indicators

Category	Indicator	Notation	Description	Expected sign on bank risk
Capital	Leverage ratio	C1	Tier 1 capital/Total assets	Negative
	Capital coverage ratio	C2	Actual own funds/Required own funds	Negative
Liquidity and Funding	Liquidity ratio	L1	Liquid assets/Total assets	Negative
	Loans-to-deposits ratio	L2	Loans/Deposit	Positive
Asset quality	Non-performing loans ratio	AQ1	NPL/Total loans and debt instruments	Positive
Business model and management	Risk weighted assets (RWA) to total assets ratio	B1	RWA/Total assets	Positive
	Return on assets	B2	Net Income/Total assets	Negative
Potential losses for the DGS	Unencumbered assets/ covered deposits	P1	Liquid assets/Covered deposits	Negative

Source: *Own work*

Table 6. Effect of risk-adjusted contributions in EDIS by country

Country	Bucket method				Sliding scale method (linear)				Sliding scale method (exponential)			
	ARW (%)	C^{EDIS} (%)	$RC^{EDIS/DGS}$ (%)	LAC (%)	ARW (%)	C^{EDIS} (%)	$RC^{EDIS/DGS}$ (%)	LAC (%)	ARW (%)	C^{EDIS} (%)	$RC^{EDIS/DGS}$ (%)	LAC (%)
AT	106.5	0.676	-15.48	99.979	96.1	0.784	-1.98	99.980	74.2	0.778	-2.81	99.980
BE	114.7	0.728	-8.99	99.991	95.4	0.778	-2.69	99.991	73.0	0.765	-4.35	99.991
CY	107.4	0.682	-14.77	99.996	87.7	0.716	-10.54	99.996	68.6	0.719	-10.09	99.996
DE	122.1	0.775	-3.14	99.976	92.8	0.758	-5.30	99.976	71.9	0.753	-5.87	99.976
EE	57.3	0.364	-54.50	99.998	65.4	0.533	-33.32	99.998	56.9	0.597	-25.40	99.998
ES	146.3	0.929	16.07	99.976	101.9	0.832	3.97	99.975	78.6	0.824	3.02	99.975
FI	81.8	0.520	-35.05	99.995	91.7	0.748	-6.45	99.995	71.2	0.746	-6.70	99.995
FR	134.7	0.855	6.90	99.975	90.7	0.740	-7.46	99.975	70.1	0.734	-8.20	99.975
GR	138.4	0.879	9.88	99.995	121.2	0.989	23.65	99.995	95.4	0.999	25.03	99.995
IE	123.1	0.782	-2.30	99.996	115.6	0.944	17.94	99.996	89.5	0.938	17.31	99.996
IT	144.0	0.915	14.32	99.971	120.9	0.986	23.30	99.974	97.3	1.020	27.44	99.975
LT	84.6	0.537	-32.83	99.997	85.2	0.696	-13.05	99.997	67.5	0.707	-11.63	99.997
LU	75.4	0.479	-40.14	99.987	83.3	0.680	-15.01	99.994	65.8	0.690	-13.81	99.994
LV	83.3	0.529	-33.91	99.995	84.5	0.689	-13.84	99.995	67.8	0.710	-11.23	99.995
MT	87.2	0.553	-30.83	99.993	89.3	0.729	-8.91	99.996	69.2	0.725	-9.39	99.996
NL	89.7	0.570	-28.80	99.997	84.9	0.693	-13.42	99.998	66.5	0.697	-12.89	99.998
PT	146.7	0.932	16.45	99.983	109.4	0.893	11.63	99.983	83.9	0.879	9.88	99.983
SI	128.0	0.813	1.60	99.992	109.8	0.896	12.04	99.992	84.2	0.883	10.34	99.992
SK	123.6	0.785	-1.88	99.957	114.0	0.930	16.26	99.957	87.5	0.917	14.68	99.957

Source: *Own work*

- Consolidation of the BU:
  - have enabled greater resilience of banks
  - COVID-19 pandemic could trigger a severe scenario
  - Development of EDIS
- We present a quantitative analysis of EDIS financing:
  - Soundness of deposit insurance
  - Clarify disciplinary problems
- We use SYMBOL model to simulate EDIS loss distribution:
  - phenomenon is rare but with very high severity
  - distribution is skewed and has a very thick tail
- Losses depend on:
  - Correlations
  - Risk of credit portfolios

- Cost of insurance varies from the European Deposit Insurance Scheme to national ones
- EDIS:
  - Degree of risk aversion/level of solvency
  - Equitable risk measures/improve risk management
  - Cross-border subsidies

Thank you for your attention

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